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Cover Page Footnote

Appreciation is expressed to the National Pork Board for financial support of this experiment and to The Hanor Company for financial and other in-kind support.

Differential Digestibility of Innate Versus Added Fat in the Diets of Growing Pigs

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Summary and Implications

The objective of this experiment was to compare the apparent total tract digestibility (ATTD) of innate fat (ether extract innate in ingredients; ENEE) versus fat added to the diet (EX) in formulations that contain increasing quantities of co-product ingredients. Results of this experiment show that diets with EX were more digestible than diets only containing ENEE. Digestion of EX (calculated by difference) showed a surprisingly large difference with ENEE much more digestible. In conclusion, fat added to the diet is much more highly digestible than innate fat which exists in the tested ingredients; therefore, energy values from fat should be estimated according to each fat source.

Introduction

Feed is the greatest cost in swine production, and the energy component represents the greatest proportion of this total. Added fat is an expensive but efficient way to increase the energy density of the diet. Differentiating the efficiency with which fat sources are used will provide more accurate formulations in terms of available energy. The objective of this experiment was to compare the apparent total tract digestibility (ATTD) of endogenous or innate fat (ether extract innate in ingredients; ENEE) versus fat added to the diet (EX) in formulations that contain increasing quantities of co-product ingredients.

Materials and Methods

There were 5 dietary treatments: a corn soybean meal-based control diet (C-S) plus two pair of two diets each, with 1 of 2 levels of co-product inclusion per pair: (6 (low co-product: LCP) or 12% (high co-product: HCP) of each of corn DDGS, wheat middlings and corn germ meal), each with or without added soybean oil (SO). SO was added at 1.7% to the LCP or at 3.4% the HCP, respectively, to maintain constant NE relative to the C-S. Diets with no added fat provided a baseline to calculate ENEE digestion. Then, within each pair of co-product diets (LCP and HCP), the ATTD of EX could be calculated by difference. Diets were formulated for both growing and finishing periods. 40 crossbred gilts (PIC 337 sires x C22 or C29; pig improvement /company, Hendersonville, TN-dams with an average body weight of 38.5±1.2 kg) were randomly assigned to one of the five treatments for a total period of 69 days. The test period was divided in growing (40 to 70 kg) and finishing (70 to 110 kg) periods. Pigs were kept in individual pens then transferred to metabolism crates for the final 13 days of each period. In crates, animals had a three day adaptation period. Urine and fecal samples were collected during 72h on days 4-6 and 11-13. All animals had access to feed and water *ad libitum* for the total test period. Results were analyzed using PROC MIXED of SAS (SAS Inst. Inc., Cary, NC).

Results and Discussion

In the growing period (GP), ATTD of ENEE increased with the addition of co-products (29.6, 36.0, and 47.5%; for C-S, LCP and HCP respectively; $P < 0.01$). In the finishing period (FP), ATTD of ENEE also increased with the addition of co-products (36.0, 47.2 and 48.2%; for C-S, LCP and HCP respectively; $P < 0.01$). In GP, ATTD of total fat in the diet was 56.8% in LCP with 1.7% added fat and 69.8% in HCP with 3.4% added fat ($P < 0.01$). In FP, ATTD of total fat in the diet was 59.2% in LCP with 1.7% added fat and 69.4% in HCP with 3.4% added fat ($P < 0.01$). By difference, the ATTD of EX was 96.0% in LCP and 94.8% in HCP in the GP and 83.2% in LCP and 93.8% in HCP in the FP. In conclusion, fat added to the diet is much more highly digested than fat which exists naturally in the tested ingredients.

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Table 1. Apparent total tract digestibility of ether extract for growing and finishing period, diets included a corn soy diet (C-S) low and high inclusion of co-products (LCP and HCP) with and without added fat (EX).

Item	C-S	LCP+EX	LCP	HCP+EX	HCP	SEM	*P*-value
Growing period							
Dietary fat origin, %							
EX fat		1.7		3.3		-	-
ENEE fat	2.9	3.2	3.3	3.7	3.8	-	-
Total fat	2.9	4.9	3.3	7.0	3.8	-	-
ATTD of EE%							
EX fat		96.0		94.8		-	
ENEE fat	29.6	36.0	36.0	47.5	47.5	-	-
Diet	29.6[e]	56.8[b]	36.0[d]	69.8[a]	47.5[c]	1.0	<0.001
Finishing period							
Dietary fat origin, %							
EX fat		1.7		3.3		-	-
ENEE fat	3.0	3.4	3.5	3.8	3.9	-	-
Total fat	3.0	5.1	3.5	7.1	3.9	-	-
ATTD of EE%							
EX fat		83.2		93.8		-	-
ENEE fat	36.0	47.2	47.2	48.2	48.2	-	-
Diet	36.0[d]	59.2[b]	47.2[c]	69.4[a]	48.2[c]	0.9	<0.001

[a,b,c] Assess significant differences ($P>0.05$) or statistical trends ($P>0.10$) between dietary treatments